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Applicant:	M'Hammed MOUNTASSIR
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Title:	METHOD OF OPTIMIZING PARAMETER VALUES IN A PROCESS OF PRODUCING A PRODUCT
Group Art Unit:	unknown
Examiner:	unknown
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10098016.110301

PETITION TO MAKE SPECIAL UNDER 37 CFR 1.102 AND MPEP 708.02 (VIII)

The Commissioner for Patents
Washington, D.C. 20231
U.S.A

Sir:

The present application was the object of a prior art search carried out at the United States Patent and Trademark Office shortly before October 12, 2001 by a professional patent searcher in the following field of search:

Class	Subclass/es		Examiners Consulted
703	2, 11, 12	-U. S. and Foreign	Frejd
700	32, 34, 103	-U. S. and Foreign	Foordon
700	28	-U. S. only	
705	1, 7, 10	-U. S. only	Rimell
706	19	-U. S. only	

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A detailed discussion of the six (6) references located is provided hereinbelow. These references are enclosed in an IDS filed herewith.

In accordance with MPEP 708.202(VIII), Applicant hereby petitions to make this application special. This Petition also constitutes Applicant's express request for immediate national stage processing under 35USC§371(f). The petition fee of $130 under 37CFR1.17(i) is included. The Commissioner is hereby authorized to charge any deficiency or credit any overpayment regarding the petition fee to deposit account 19-5113.

Applicant According to MPEP 708.02 (VIII), Applicant:

a) requests that this application be made special under 37CFR1.102;

b) consents to elect claims 40 to 51 and related claims if the Examiner finds that a restriction is justified and required **under 37CFR1.475**;

c) submits herewith the results of a prior search;

d) is submitting herewith, a copy of each of the references located;

e) is submitting herewith a detailed discussion which points out, with the particularity required by 37 CFR 1.111(b) and (c), how the claimed subject matter is patentable over the references.

DETAILED DISCUSSION OF THE PRESENT APPLICATION

The present application discloses a method for optimizing process parameters in a process for producing a product. This relates to the general field of experimental design and process improvement. The invention can be applied to any process that is controlled by a set of parameters affecting properties characterizing the product.

A detailed discussion of the state of the art is provided in the Background of the Invention section of Applicant's specification. As an additional immediate reference, Applicant has attached a copy of sections 5.1.1, 5.3.2, 5.3.3.3 and 5.3.3.4 of the Engineering Statistics Handbook (beta version) available on the NIST website. It will be appreciated that the full factorial matrix method is most commonly applied, and that the fractional factorial matrix method is also applied in industry today. Figure 1.1 in section 5.1.1 illustrates clearly how process parameters (i.e. factors) influence the properties of

a product resulting from a process (i.e. responses). In the full factorial matrix method, Table 3.2 in section 5.3.3.3 illustrates clearly how the number of runs required increases exponentially with the number of process parameters (i.e. factors). Table 3.1 of section 5.3.3 illustrates how one may choose an experimental design as a function of the number of process parameters and objective.

In Applicant's invention, the method of producing a product comprises initial steps of optimizing process parameters. The product is characterized by a set of properties. These product properties may be physical properties such as color, weight, strength, resistance, etc. In Applicant's invention, property weights representing an importance of the product properties relative to one another are selected. These property weights are used in conjunction with chosen process parameter values and corresponding product properties to calculate a set of optimal values for the process parameters.

The impact of Applicant's invention is that the number of experimental runs required to calculate the optimal values can be reduced significantly with respect to prior art techniques while maintaining desired accuracy. Tests have shown that Applicant's method will yield optimal values from a number of experimental runs equal to the number of process parameters monitored plus one, and these optimal values are consistently close to optimal values obtained using full or fractional factorial matrix methods. Applicant's method relies on defining the importance of the product properties relative to one another, and in using this data in the calculation of the optimal values from the experimental data of product properties and process parameter values from the reduced number of runs.

SUMMARY OF THE INDEPENDENT CLAIMS

Summary of Claim 25: The method of claim 25 defines assigning property weights to the product properties, and then determining a goal function that is minimized to generate the optimal values for the process parameters. Thus, claim 25 defines a method of producing a product according to a process essentially controlled by a set of

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n parameters X_i affecting a set of k properties Y_j characterizing the product. The method comprises:

i. assigning values to a set of k property weights w_j representing relative importance of the properties Y_j for the characterization of the product;

ii. establishing property behavior mathematical relations giving an estimated property Ye_j for each the property Y_j in terms of the parameters X_i from given parameter data and associated property data;

iii. using the property weights w_j to establish a goal function in terms of property weighted deviations between the estimated properties Ye_j and corresponding specified goal values for the properties Y_j;

iv. minimizing the goal function to generate a set of n optimal parameter values for the parameters X_i; and

v. using the set of optimal parameter values in the process to produce the product.

Summary of claim 40: The method of claim 40 defines the steps of conducting a reduced number of experimental runs in combination with determining property weights for the product properties to calculate the optimal values for the process parameters. The method comprises:

a) conducting a number of l of experimental runs of the process each using a selected distinct set of values for the parameters X_i covering substantially all extreme values within a chosen range of values for each one of the parameters X_i, wherein l is at least equal to n + 1 and is substantially less than a number used in the Fractional Factorial Matrix method;

b) measuring values for the properties Y_j characterizing the product in each of the l experimental runs, whereby parameter data and associated property data are obtained from the selected distinct set of values for the parameters X_i and the measured values for the properties Y_j, respectively;

c) determining an importance of the properties Y_j for the characterization of the product, comparing the importance of the properties Y_j relative to one another, and assigning values to a set of k property weights w_j representing a relative importance of the properties Y_j for the characterization of the product;

d) calculating a set of optimal parameter values for the parameters X_i using the measured values for the properties Y_j and the assigned values of the set of k property weights w_j; and

e) producing the product using the optimized process parameter values X_i calculated in the previous step.

DETAILED DISCUSSION OF REFERENCES LOCATED DURING SEARCH:

5,119,468 June 2, 1992 Owens

This reference discloses an apparatus and method for controlling a process using a trained parallel distributed processing network. It describes both batch initialization and on-going control of a physical process using a parallel distributed processing network previously trained to stimulate the process, the process being of the type in which inputs have predetermined physical parameters P produce a product having corresponding physical characteristics C. The disclosed method involves: (a) producing a set of goal signals G corresponding to the desired physical characteristics D of the product of the process; (b) determining the error E between the goal signals G and the outputs Y of the network; (c) determining the values of the updated inputs of the parallel distributed processing network that are needed to drive the error E to a

predetermined minimum, and (d) changing the actual physical parameters P of the process to correspond to the updated inputs values producing the minimum error.

However, the disclosed method does not teach assigning values to a set of property weights representing relative importance of the product properties.

5,218,526 June 8, 1993 Mozzo

This reference is discussed in detail in Applicant's specification at page 3, line 16 to page 4, line 11. As mentioned therein, the weightings as taught by Mozzo do not reflect the relative importance of the product properties involved.

5,457,625 October 10, 1995 Lim et al.

This reference discloses a method of maximizing process production rates using permanent constraints. The described method optimizes the relationship of variables associated with a process having inputs and outputs such that the process has controlled variables, manipulated variables, associated variables and disturbance variables, to maximize production rates, and includes the steps of (a) measuring variables of the process comprising controlled, manipulated, associated and disturbance variables; (b) weighting errors associated with at least one controlled variable relative to other controlled variables so as to prioritize errors associated with the controlled variables; (c) optimizing controlled variable deviations from associated setpoints over a predetermined future time horizon based upon manipulated variable differential moves, such as calculating the sum of the squares of the deviations of the controlled variables with the independent variable being the differential moves of the manipulated variable, or calculating the least squares of the deviations of the controlled variables such that the independent variable includes the differential movement of the manipulated variable; (d) suppressing errors associated with at least one future controlled variable by penalizing for large manipulated variable movement for balancing the reduction of future control error against large manipulated variable movement; (e) weighting at least one manipulated variable for reducing deviation of the manipulated variable from a permanent constraint so as to allow preferential movement of at least one of the manipulated variables over another manipulated variable; (f) applying a

constraint deviation variable to effectuate associated variable deviations outside allowable bounds; and (g) controlling the plant operation in accordance with the differential moves determined in steps (b) through (f).

However, the described method does not teach assigning values to a set of property weights representing relative importance of the product properties.

5,500,795 March 19, 1996 Powers et al.

This reference discloses a method and system for monitoring and controlling the performance of a call-processing center. The method involves defining a plurality of performance variables describing measurable properties of the organization, assigning a weighting factor to each of the normalized performance variables to produce a plurality of weighted normalized performance variables, and calculating the efficiency of the organization as a function of the plurality of weighted normalized performance variables.

This reference does not teach a method of producing a product as defined in Applicant's claims 25 and 40, and does not teach assigning values to a set of property weights representing relative importance of the product properties.

5,933,348 August 3, 1999 Kurtzberg et al.

This patent, granted to IBM, discloses a method for optimizing an experimental design used in a manufacturing process, involving: (1) selecting a number of points for the experimental design; (2) selecting a desired maximum number of interactions among process variables to be included in the experimental design; (3) assigning weights to each of the process variables and all the interactions up to the maximum number; (4) creating a sorted list of decreasing weights by ranking all the process variables and the interactions according to the weights; (5) normalizing the weights to aggregate to unity; (6) obtaining the points assigned to each of the process variables and the interactions by multiplying the normalized weights by the number of points; and (7) utilizing the obtained points to optimize the experimental design.

Kurtzberg teaches a method for experimental design, in which the design is influenced by property weights. Kurtzberg teaches using the property weights to choose

the parameters for the runs, in a manner that makes the experimental design more efficient. In Applicant's invention as defined in either claim 25 or claim 40, the property weights are not used to determine the run parameters, but rather, they are used in the calculation that gives the optimized values of the process parameters from the run data, i.e. the process parameter values and product property values obtained from the experimental runs. Kurtzberg therefore does not teach or suggest Applicant's invention as defined in claim 25 or in claim 40.

6,056,781 May 2, 2000 Wassick et al.

This reference is a continuation of US patent 5,740,033 and relates a model predictive controller for a process control system. The process control system includes a real-time executive sequencer projecting a set of future process parameter values to be controlled, and an interactive modeler solving a set of equations as to how the physical process will react to control changes in order to determine an optimized set of control changes. A method involves: projecting a desired set of desired directly controlled parameter values and at least one desired indirectly controlled parameter value over a predetermined control horizon; periodically estimating how the apparatus will react to proposed changes to the value of at least one manipulated parameter over the control horizon, and determining a set of current and future manipulated parameter values which will minimize deviations from the desired set; and causing a process control device in the apparatus to implement the manipulated parameter values.

This reference does not teach a method of producing a product as defined in Applicant's claims 25 and 40, and does not teach assigning values to a set of property weights representing relative importance of the product properties.

CONCLUSION

It is respectfully submitted that none of the references located during Applicant's search discloses or suggests, taken alone or in combination, the method defined in claim 25 or claim 40.

PETITION TO MAKE SPECIAL

In view of the foregoing, it is believed that the present application is in good order to be made special, and early consideration to that end is accordingly courteously solicited.

In accordance with 37 CFR 1.97(h), the submission of the present information is not to be construed as an admission that such information is, or is to be considered to be material to patentability.

Respectfully submitted,

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